



BUILDING A SMARTER ENERGY FUTURE<sup>SM</sup>

Public Service Commission of South Carolina Allowable Ex Parte

# Managing Duke Energy Hydroelectric Projects

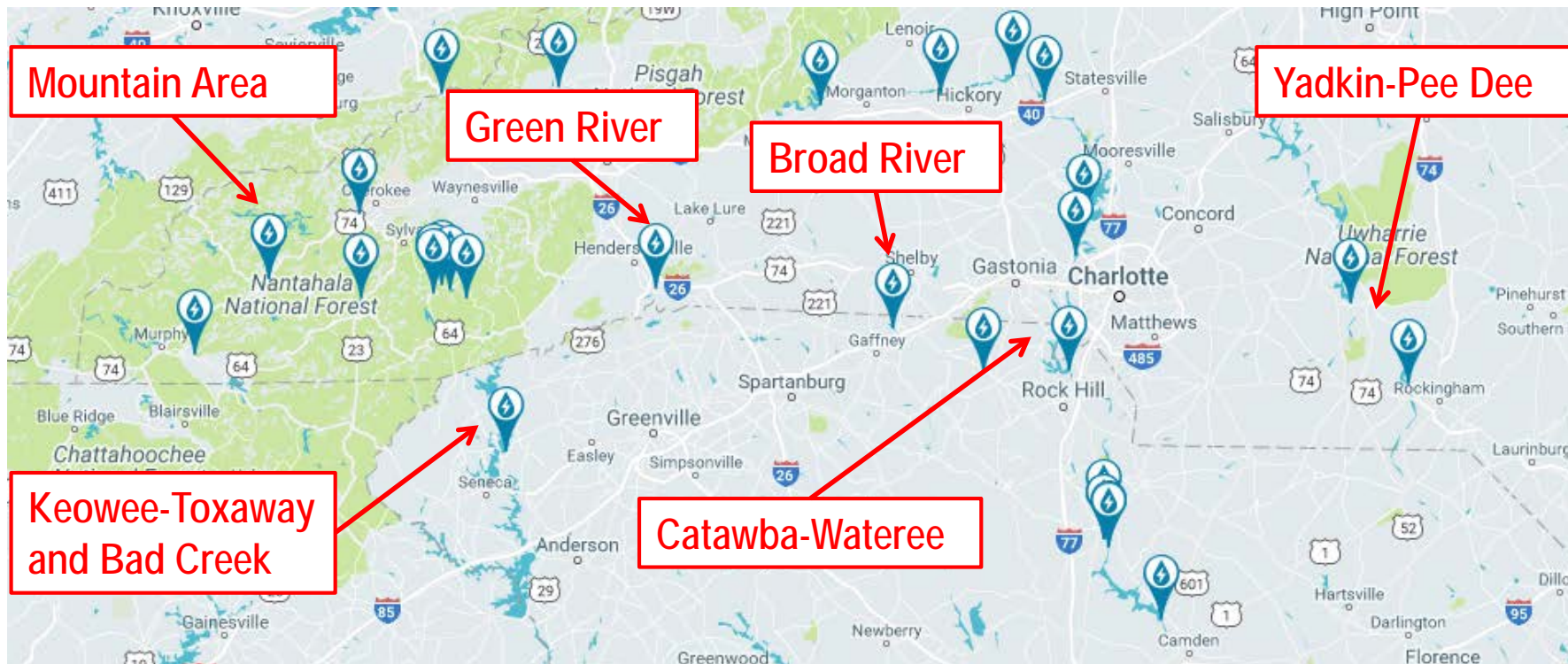


*July 23, 2018*

PRESENTED BY:

Duke Energy Carolinas (DEC) and Duke Energy Progress (DEP)





32 hydro reservoirs enable:

- Hydropower
- Thermoelectric power
- Drinking water
- Recreation
- Shoreline development
- Flood and drought management
- Economic growth



## Presenter

Jeff Lineberger  
**Duke Energy**

*Director, Water Strategy and Hydro Licensing*

License  
"Ingredients"



License  
Requirements

Technical studies	Water quality certifications (N.C. and S.C.)
Stakeholder agreements	Endangered species conditions
Legal settlement agreements	Fish passage prescriptions

FERC licenses (30-50 years) regulate hydro operations and shape the rivers' uses including:

Normal Conditions	Drought Conditions	Emergency Conditions
<ul style="list-style-type: none"><li>▪ Lake levels</li><li>▪ Aquatic flows</li><li>▪ Recreation flows</li><li>▪ Recreation facilities</li></ul>	<ul style="list-style-type: none"><li>▪ Drought protocols</li></ul>	<ul style="list-style-type: none"><li>▪ Emergency River Access</li><li>▪ High Water Events</li><li>▪ Grid Emergencies</li><li>▪ Unexpected Outages</li><li>▪ Planned Outages</li></ul>





- Hydro relicensing processes **embraced** stakeholder collaboration
  - 250+ stakeholder representatives
  - Hundreds of public workshops
  - Independently facilitated teams
  - Informed by sound science and engineering
- Emphasis on making the rivers better for all interests for next FERC license term
- All stakeholders negotiated relicensing agreements (most signed binding agreements)
- End product: Stakeholder-supported “new vision” tailored to meet regional needs

“Alone we can do so little; together we can do so much.”  
– Helen Keller

## Droughts

- Drought management advisory groups
- Public water utilities, industries, resource agencies, DEC/DEP
- Shared resource = shared responsibility
- Drives Low Inflow Protocol (LIP) implementation and communications
- <https://www.duke-energy.com/community/lakes>
- LIP is single most important drought management tool in the applicable river basins
- “Safety net” for public drinking water, industrial water users, aquatic communities and power generation that never existed before



*Lake Jocassee at 26.3 feet below full pond on Oct. 6, 2008*



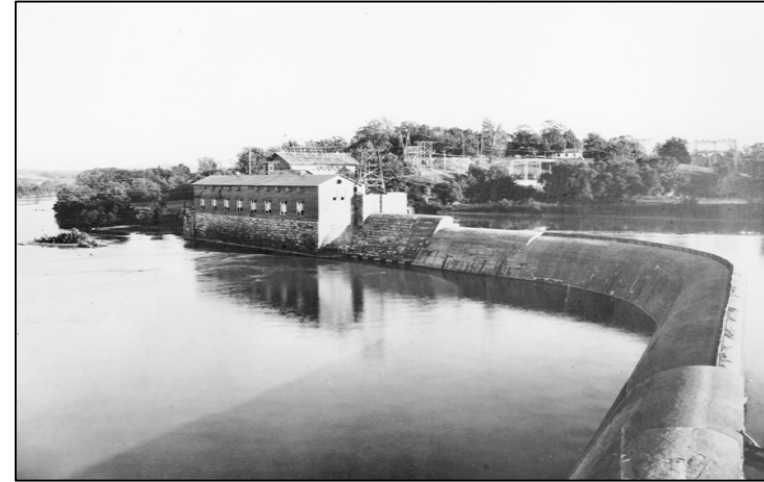
## Presenter

Randy Herrin  
**Duke Energy**

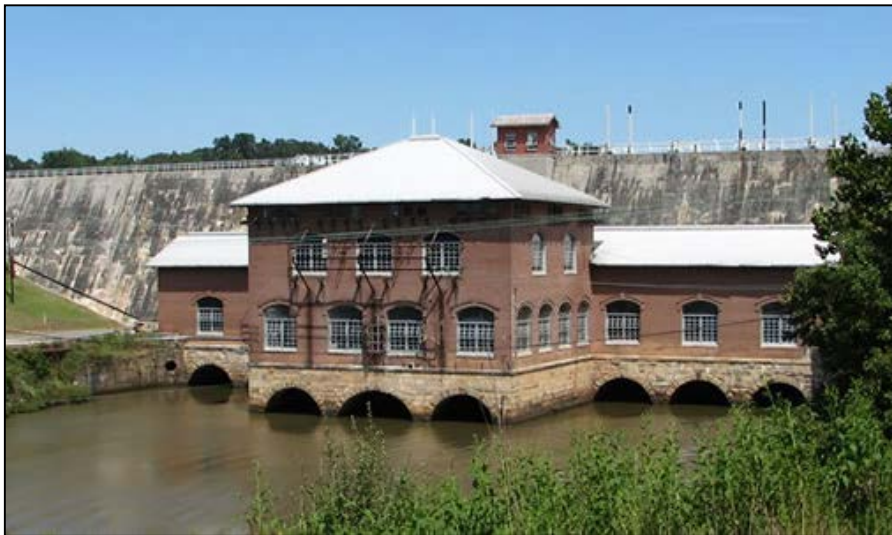
*Vice President, Carolinas Regulated Renewables*



- 100+ years of clean, renewable hydropower
- 5.2 million MWh of electricity produced in 2017 by DEC and DEP hydros combined
- Provides flexible and dispatch-capable energy to customers



*Catawba hydro, circa 1904 (replaced by Wylie hydro in 1925)*



*Great Falls hydro*



*Cowans Ford hydro*

- Bad Creek and Jocassee pumped storage hydros have reversible generating units
  - Generate to meet electric demand
  - Pump water back uphill to store energy
  - Tremendous grid support
- Pumped storage hydro helps add other renewables, like solar, to the grid
- DEC is adding approximately 335 megawatts to Bad Creek over the next five years



*Bad Creek Pumped Storage Station*



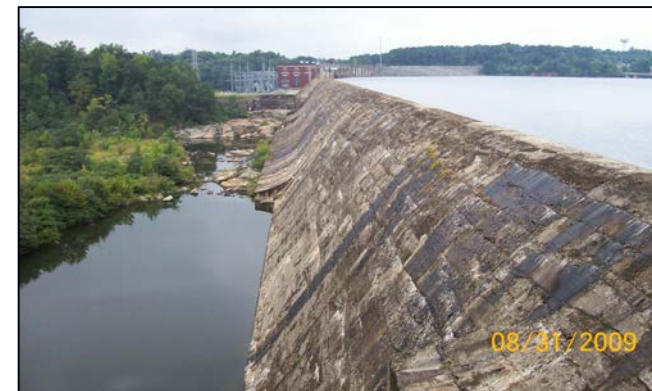
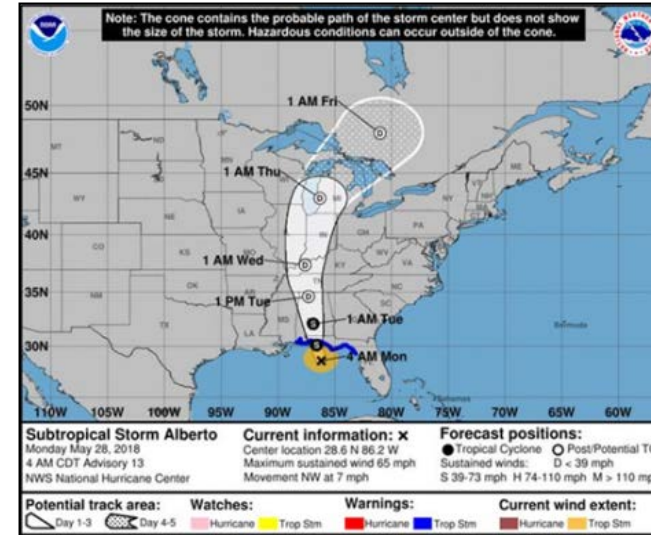
*Jocassee Pumped Storage Station*

## Floods

- Every storm is unique
- Fundamentals:
  - Prepare
  - Predict and store runoff
  - Systematically release water
  - Minimize safety/property risks
  - Communicate



*Lake with gated spillway:  
Full pond (100 feet) = top of spillway gates*



*Lake with ungated (overflow) spillway:  
Full pond (100 feet) = crest of spillway*

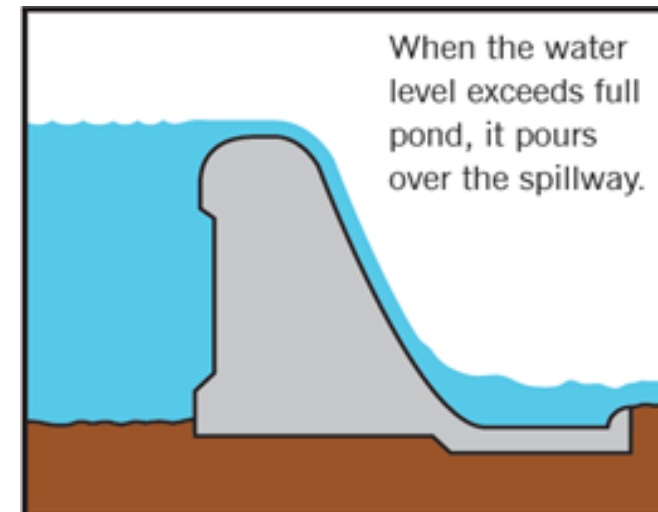
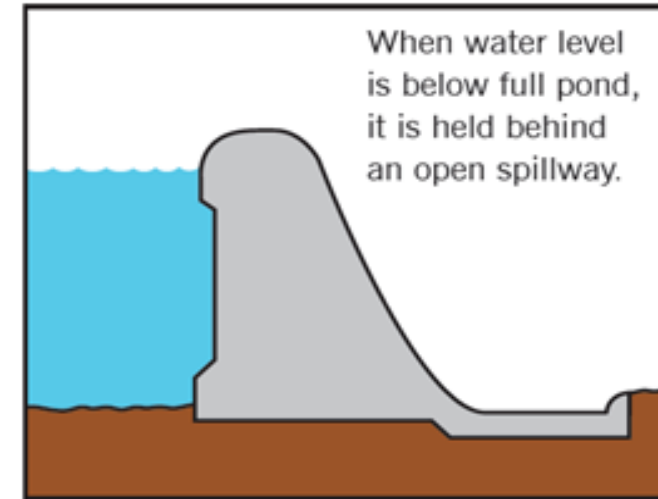


## Lakes with ungated (overflow) spillways

- When there is more river flow coming into the lake than can be passed through the powerhouse, the lake level rises above the crest of the spillway and flows over the top.
- The lake level will be higher than full pond for the remainder of the storm event.
- The simple, effective design of an open spillway allows large volumes of excess water to move downstream.



*Wateree Hydro Station and dam*

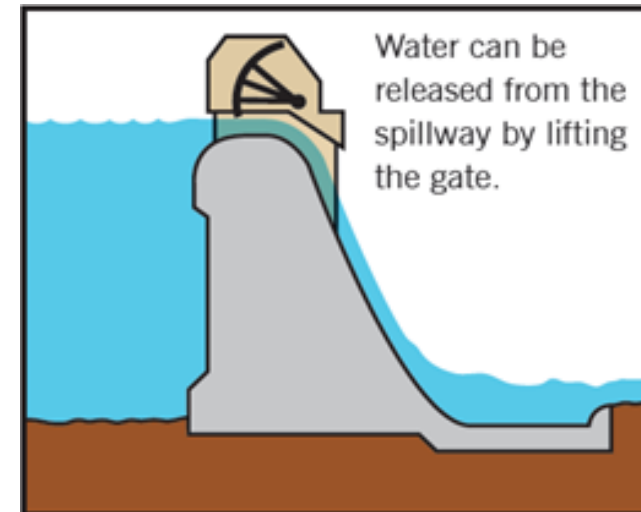
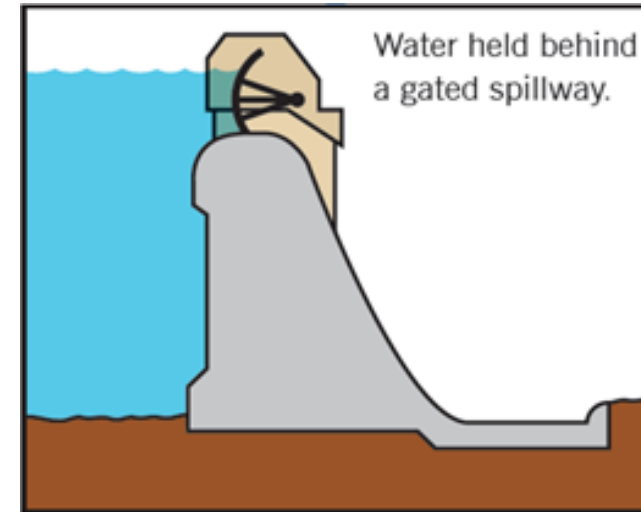


## Lakes with gated spillways

- DEC and DEP will not allow water to spill over these gates since trash or floating debris could impact gate operability.
- When there is more river flow coming into the lake than can be passed through the powerhouse, spillway gates are opened to pass the extra flow.
- A gated spillway consists of manually and automatic operated floodgates that are tested on a routine basis.



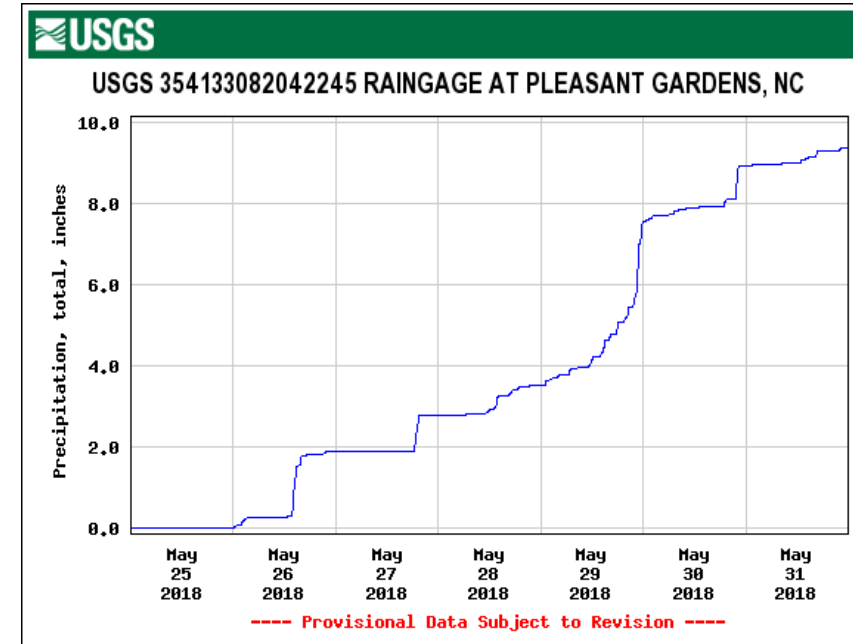
*Tillery flood gates*





## Catawba-Wateree focus

- Region received significant amounts of rain, including in the Upper Catawba River Basin
- This storm followed a wet April and May – soils were already saturated and lakes were above normal seasonal targets
- Prior to Alberto, DEC was lowering lake levels to their normal seasonal targets
- Throughout the storm and the related high inflow event, DEC coordinated closely with local emergency response officials
- Updated lake information was posted on the DEC toll-free phone system (800.829.5253) and website: [www.duke-energy.com/community/lakes](http://www.duke-energy.com/community/lakes)

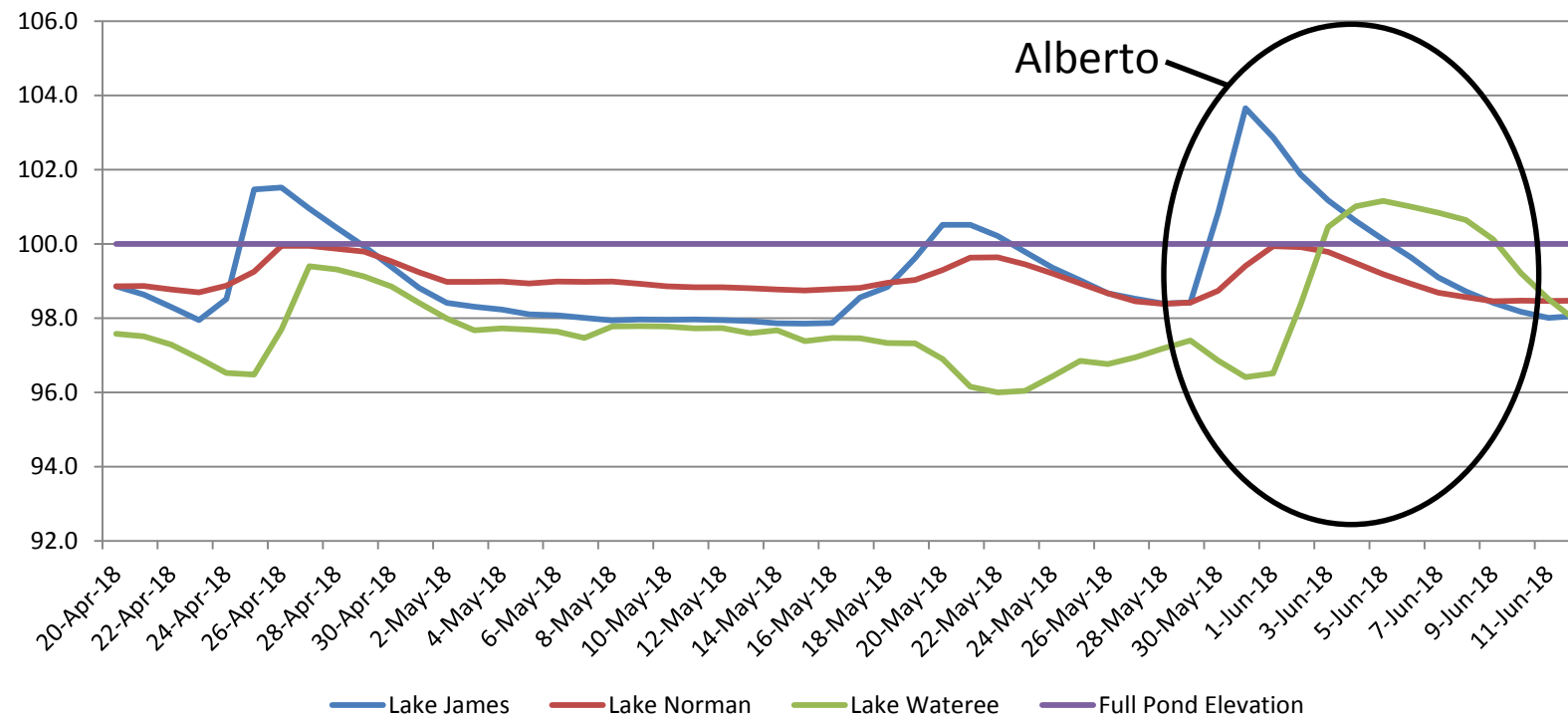


USGS: United States Geological Survey

## Catawba-Wateree focus

- Reservoir storage in NC (e.g., Lakes James and Norman) mitigated impacts to SC reservoirs
- Lake James rose to about 3.5 ft. over full pond and Lake Norman was at 100 ft. and rising (very rare)
- Lake Wateree did not begin to rise and spill until after Lakes James and Norman storage was filled

**Catawba-Wateree Reservoir Levels**



### Catawba-Wateree focus

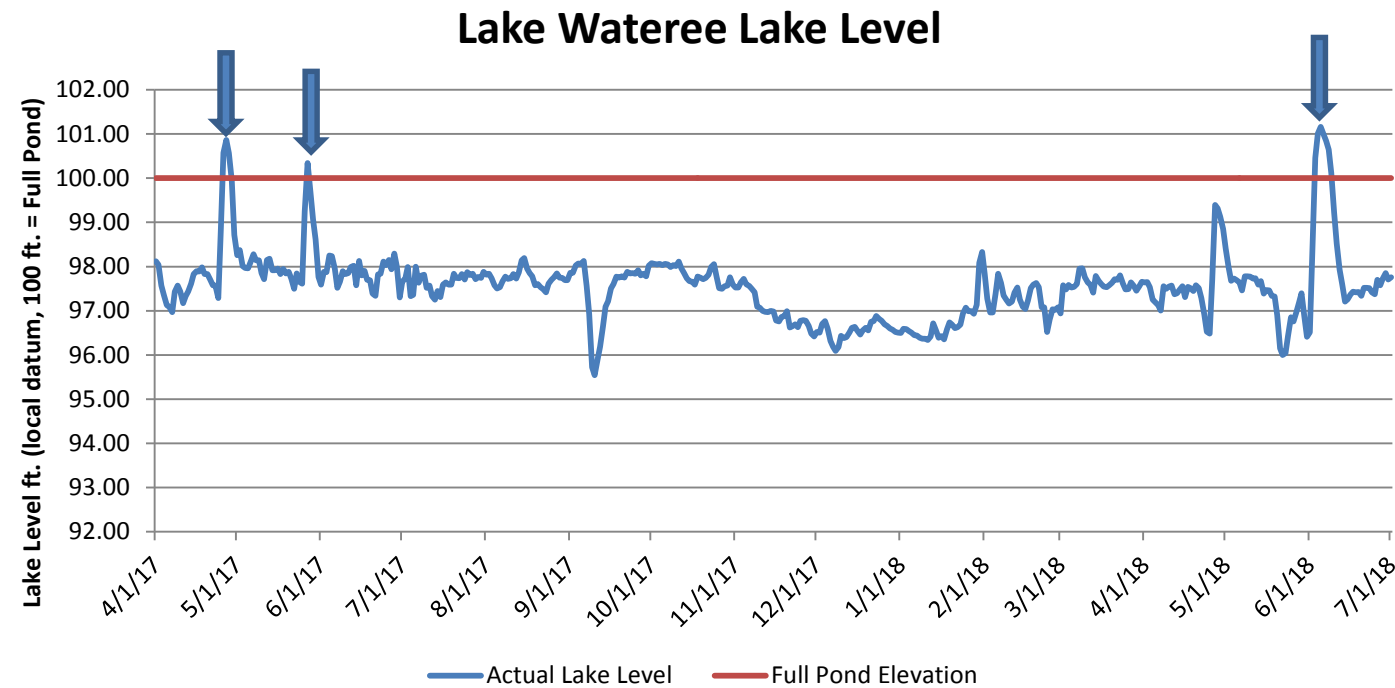
- DEC is required by our FERC license<sup>1</sup> and Comprehensive Relicensing Agreement<sup>2</sup> to lower reservoirs back to their seasonal target levels. This means moving water downstream through the 11-reservoir system for days.
- Spilling at reservoirs with no flood gates (about one foot over full pond) expedites returning lake levels to normal and prepares for future rain events.
- Lake Wateree, the most downstream reservoir, has to pass all the high water from all 10 upstream reservoirs, which takes days.

<sup>1</sup>FERC License: <https://www.duke-energy.com//media/pdfs/community/lakes-and-rec/ferc-order-new-cw-license-11-25-2015.pdf>

<sup>2</sup>Comprehensive Relicensing Agreement: <https://www.duke-energy.com//media/pdfs/community/comp-relicensing-agreement.pdf>

## Past and future

- Over the past 15 months, Lake Wateree has spilled two other times with both of those times being less than one foot over full pond.
- Modifications to the Wateree spillway are scheduled for completion by March 2026 to increase flow release capacity by 10,000 cfs (nearly 75,000 gallons per second = over 400 Olympic-sized swimming pools per hour).



**Myth:** DEC manages flooding events differently on the North Carolina lakes (e.g., Norman) than the South Carolina lakes.

**Truth:** Management fundamentals are exactly the same. Differences from lake-to-lake arise from lake-specific factors (e.g., gated v. ungated spillways, location/amount of the rainfall, shoreline topography, etc.).

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**Myth:** These lakes were designed for flood control, but DEC doesn't operate them that way.

**Truth:** Flood control reservoirs (e.g., Lake Hartwell) have normal target levels that are lower and provide much greater unused water storage capacity. Catawba-Wateree lakes' target storage is closer to the full pond storage, providing some ability to help manage modest flooding events.

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**Myth:** DEC waits too long to begin drawing down reservoirs when a storm is approaching.

**Truth:** Forecasting actual inflow from an approaching storm is complex and not an exact science. DEC balances preparatory drawdowns with the possibility the storm will miss the river basin to avoid an unintentional water shortage.





## Presenter

Jeff Lineberger  
**Duke Energy**

*Director, Water Strategy and Hydro Licensing*

## Catawba-Wataree Water Management Group

### ■ Organization and Purpose

- 501c(3) nonprofit corporation formed in 2007
- 18 public water utilities and DEC
- \$550,000 total annual member dues
- Purpose is to enhance river's ability to support human needs while protecting the environment



### ■ Together we can do so much – Over \$5 Million invested so far in technical projects such as:

- Irrigation efficiency improvements
- Water conservation tool kit
- Water intake contingency plans
- Reducing water loss
- Sedimentation and groundwater monitoring
- Better water demand forecasting and modeling



*Rock Hill water intake on Lake Wylie*

### ■ Water Supply Master Plan ([www.catawbawatereewmg.org](http://www.catawbawatereewmg.org))

- Integrated resource planning in one river basin for water utilities and DEC
- Includes actions to extend shared water supply at least to 2100

QUESTIONS?

